DEPARTMENT OF TRANSPORTATION
DES-OE MS #43
1727 30TH Street, 2ND Floor
Sacramento, CA 95816

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July 3, 2003

10-Sta-99-R10.9/15.5
10-3A4504
ACNHG-ACNH-P099(456)E

Addendum No. 4

Dear Contractor:

This addendum is being issued to the contract for construction on State highway in STANISLAUS COUNTY NEAR TURLOCK FROM TAYLOR ROAD UNDERCROSSING TO 1.5 KM NORTH OF FAITH HOME ROAD UNDERCROSSING.

Submit bids for this work with the understanding and full consideration of this addendum. The revisions declared in this addendum are an essential part of the contract.

Bids for this work will be opened on July 16, 2002.

This addendum is being issued to revise the Project Plans and the Notice to Contractors and Special Provisions.

Project Plan Sheet 2 the communication conduit depth as shown is revised to 762 mm.

Project Plan Sheet 25 notes number 8, 9 and 10 are revised by deleting the words "State-furnished" and replacing with "Furnish and install".

Project Plan Sheet 28 note number 5 is revised by deleting the words "State-furnished" and replacing with "Furnish and install". Note 8 at TMS location 8 is revised to Note 5. "JACK" for conduit run across northbound lane, 53C 1 TEL is deleted.

In the Special Provisions, Section 4, "BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES," is replaced as attached.

In the Special Provisions, Section 5-1.12, "PAYMENTS," is replaced as attached.

In the Special Provisions, Section 8-1.03, "STATE-FURNISHED MATERIALS," under the second paragraph Items "J. Closed circuit television (CCTV) system", "K. Microwave vehicle detection system (MVDS)" and "L. Weather station system" are deleted.

In the Special Provisions, Section 10-1.20A, "PILING," is added as attached.

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In the Special Provisions, Section 10-1.26, "THRIE BEAM BARRIER," the following paragraphs are added at the end of the section:

"Full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing minor concrete (minor structure), as shown on the plans, as specified in Section 51, "Concrete Structures," of the Standard Specifications, and as directed by the Engineer shall be considered as included in the contract price paid for per meter for metal bean guard rail and no separate payment will be made therefor.

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structure," of the Standard Specifications and these special provisions."

In the Special Provisions, Section 10-3.02A, "FOUNDATIONS," is added as follows:

"**10-3.02A FOUNDATIONS**
Reinforced cast-in-drilled-hole concrete pile foundations for lighting standards shall conform to the provisions in "Piling" of these special provisions."

In the Special Provisions, Section 10-3.02B, "STANDARDS, STEEL PEDESTALS AND POLES," is added as follows:

"**10-3.02B STANDARDS, STEEL PEDESTALS AND POSTS**
Standards, steel pedestals and posts for lighting standards shall conform to the provisions in "Steel Structures" of these special provisions."

In the Special Provisions, Section 10-3.09, "STATE-FURNISHED CLOSED CIRCUIT TELEVISION SYSTEM," is replaced as attached.

In the Special Provisions, Section 10-3.10, "STATE-FURNISHED MICROWAVE VEHICLE DETECTION SYSTEM," is replaced as attached.

In the Special Provisions, Section 10-3.11, "STATE-FURNISHED WEATHER STATION SYSTEM," is replaced as attached.

In the Special Provisions, Section 10-3-13, "PAYMENT" is replaced as attached.

In the Proposal and Contract, the Engineer's Estimate Items 18 and 19 are revised as attached.

To Proposal and Contract book holders:

Replace page 3 of the Engineer's Estimate in the Proposal with the attached revised page 3 of the Engineer's Estimate. The revised Engineer's Estimate is to be used in the bid.

Indicate receipt of this addendum by filling in the number of this addendum in the space provided on the signature page of the proposal.

Submit bids in the Proposal and Contract book you now possess. Holders who have already mailed their book will be contacted to arrange for the return of their book.

Inform subcontractors and suppliers as necessary.

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This office is sending this addendum by confirmed facsimile to all book holders to ensure that each receives it. A copy of this addendum and the modified wage rates are available for the contractor's use on the Internet Site:

http://www.dot.ca.gov/hq/esc/oe/weekly_ads/addendum_page.html

If you are not a Proposal and Contract book holder, but request a book to bid on this project, you must comply with the requirements of this letter before submitting your bid.

Sincerely,

ORIGINAL SIGNED BY:

REBECCA D. HARNAGEL, Chief
Office of Plans, Specifications & Estimates
Office Engineer

Attachments

SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES

Attention is directed to the provisions in Section 8-1.03, "Beginning of Work," in Section 8-1.06, "Time of Completion," and in Section 8-1.07, "Liquidated Damages," of the Standard Specifications and these special provisions.

The Contractor shall furnish the Engineer with a statement from the vendor that the order for the sign structure and electrical materials required for this contract has been received and accepted by the vendor; and the statement shall be furnished within 15 calendar days after the contract has been approved by the Attorney General, or the attorney appointed and authorized to represent the Department of Transportation. The statement shall give the date that the sign structure and electrical materials will be shipped. If the Contractor has the necessary materials on hand, the Contractor will not be required to furnish the vendor's statement.

The Contractor shall begin work within 90 calendar days after the contract has been approved by the Attorney General or the attorney appointed and authorized to represent the Department of Transportation.

The work shall be diligently prosecuted to completion before the expiration of **50 WORKING DAYS** beginning on the date that work begins, or beginning on the ninetieth calendar day after approval of the contract, whichever occurs first.

The Contractor shall pay to the State of California the sum of $ 4,700.00 per day, for each and every calendar day's delay in finishing the work in excess of the number of working days prescribed above.

The 72 hours advance notice before beginning work specified in Section 8-1.03, "Beginning of Work," of the Standard Specifications is changed to 5 days advance notice for this project.

5-1.12 PAYMENTS

Attention is directed to Sections 9-1.06, "Partial Payments," and 9-1.07, "Payment After Acceptance," of the Standard Specifications and these special provisions.

For the purpose of making partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications, the amount set forth for the contract items of work hereinafter listed shall be deemed to be the maximum value of the contract item of work which will be recognized for progress payment purposes:

A. Clearing and Grubbing $ 10,000.00

After acceptance of the contract pursuant to the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, the amount, if any, payable for a contract item of work in excess of the maximum value for progress payment purposes hereinabove listed for the item, will be included for payment in the first estimate made after acceptance of the contract.

No partial payment will be made for any materials on hand which are furnished but not incorporated in the work.

10-1.20A PILING

GENERAL

Piling shall conform to the provisions in Section 49, "Piling," of the Standard Specifications, and these special provisions.

Unless otherwise specified, welding of any work performed in conformance with the provisions in Section 49, "Piling," of the Standard Specifications, shall be in conformance with the requirements in AWS D1.1.

Foundation recommendations are included in the "Information Handout" available to the Contractor as provided for in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

Attention is directed to "Welding" of these special provisions.

Difficult pile installation is anticipated due to the presence of underground utilities, overhead utilities, sound control, vibration monitoring and traffic control.

CAST-IN-DRILLED-HOLE CONCRETE PILES

Cast-in-drilled-hole concrete piling shall conform to the provisions in Section 49-4, "Cast-In-Place Concrete Piles," of the Standard Specifications and these special provisions.

The provisions of "Welding" of these special provisions shall not apply to temporary steel casings.

Cast-in-drilled-hole concrete piles 600 mm in diameter or larger may be constructed by excavation and depositing concrete under slurry.

Materials

Concrete deposited under slurry shall have a nominal penetration equal to or greater than 90 mm. Concrete shall be proportioned to prevent excessive bleed water and segregation.

Concrete deposited under slurry shall contain not less than 400 kg of cementitious material per cubic meter.

The combined aggregate grading used in concrete for cast-in-drilled-hole concrete piling shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading and shall conform to the requirements in Section 90-3 "Aggregate Gradings," of the Standard Specifications.

Mineral Slurry

Mineral slurry shall be mixed and thoroughly hydrated in slurry tanks, and slurry shall be sampled from the slurry tanks and tested before placement in the drilled hole.

Slurry shall be recirculated or continuously agitated in the drilled hole to maintain the specified properties.

Recirculation shall include removal of drill cuttings from the slurry before discharging the slurry back into the drilled hole. When recirculation is used, the slurry shall be sampled and tested at least every 2 hours after beginning its use until tests show that the samples taken from the slurry tank and from near the bottom of the hole have consistent specified properties. Subsequently, slurry shall be sampled at least twice per shift as long as the specified properties remain consistent.

Slurry that is not recirculated in the drilled hole shall be sampled and tested at least every 2 hours after beginning its use. The slurry shall be sampled midheight and near the bottom of the hole. Slurry shall be recirculated when tests show that the samples taken from midheight and near the bottom of the hole do not have consistent specified properties.

Slurry shall also be sampled and tested prior to final cleaning of the bottom of the hole and again just prior to placing concrete. Samples shall be taken from midheight and near the bottom of the hole. Cleaning of the bottom of the hole and placement of the concrete shall not start until tests show that the samples taken from midheight and near the bottom of the hole have consistent specified properties.

Mineral slurry shall be tested for conformance to the requirements shown in the following table:

MINERAL SLURRY		
PROPERTY	REQUIREMENT	TEST
Density (kg/m^3) - before placement in the drilled hole - during drilling - prior to final cleaning - immediately prior to placing concrete	1030* to 1110* 1030* to 1200*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) bentonite attapulgite	29 to 53 29 to 42	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - immediately prior to placing concrete	less than or equal to 4.0	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 degrees Celsius when tested.		

Any caked slurry on the sides or bottom of hole shall be removed before placing reinforcement. If concrete is not placed immediately after placing reinforcement, the reinforcement shall be removed and cleaned of slurry, the sides of the drilled hole cleaned of caked slurry, and the reinforcement again placed in the hole for concrete placement.

Synthetic Slurry

Synthetic slurries shall be used in conformance with the manufacturer's recommendations and these special provisions. The following synthetic slurries may be used:

PRODUCT	MANUFACTURER
SlurryPro EXL	KB Technologies Ltd. 3648 FM 1960 West Suite 107 Houston, TX 77068 (800) 525-5237
Super Mud	PDS Company c/o Champion Equipment Company 8140 East Rosecrans Ave. Paramount, CA 90723 (562) 634-8180
Shore Pac GCV	CETCO Drilling Products Group 1350 West Shure Drive Arlington Heights, IL 60004 (847) 392-5800

Inclusion of a synthetic slurry on the above list may be obtained by meeting the Department's requirements for synthetic slurries. The requirements can be obtained from the Office of Structure Design, P.O. Box 942874, Sacramento, CA 94274-0001.

Synthetic slurries listed may not be appropriate for a given site.

Synthetic slurries shall not be used in holes drilled in primarily soft or very soft cohesive soils as determined by the Engineer.

A manufacturer's representative, as approved by the Engineer, shall provide technical assistance for the use of their product, shall be at the site prior to introduction of the synthetic slurry into a drilled hole, and shall remain at the site until released by the Engineer.

Synthetic slurries shall be sampled and tested at both mid-height and near the bottom of the drilled hole. Samples shall be taken and tested during drilling as necessary to verify the control of the properties of the slurry. Samples shall be taken and tested when drilling is complete, but prior to final cleaning of the bottom of the hole. When samples are in conformance with the requirements shown in the following tables for each slurry product, the bottom of the hole shall be cleaned and any loose or settled material removed. Samples shall be obtained and tested after final cleaning and immediately prior to placing concrete.

SlurryPro EXL synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SLURRYPRO EXL KB Technologies Ltd.		
PROPERTY	REQUIREMENT	TEST
Density (kg/m^3) - during drilling - prior to final cleaning - just prior to placing concrete	 less than or equal to 1075* less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling -prior to final cleaning - just prior to placing concrete	 53 to 127 less than or equal to 74	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	6 to 11.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	 less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 degrees Celsius when tested.		

Super Mud synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SUPER MUD PDS Company		
PROPERTY	REQUIREMENT	TEST
Density (kg/m^3) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	34 to 64 less than or equal to 64	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 degrees Celsius when tested.		

Shore Pac GCV synthetic slurries shall be tested for conformance to the requirements shown in the following table:

Shore Pac GCV CETCO Drilling Products Group		
PROPERTY	REQUIREMENT	TEST
Density (kg/m^3) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	35 to 78 less than or equal to 60	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8.0 to 11.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 degrees Celsius when tested.		

Water Slurry

At the option of the Contractor water may be used as slurry when casing is used for the entire length of the drilled hole. Water slurry shall be tested for conformance to the requirements shown in the following table:

WATER SLURRY		
PROPERTY	REQUIREMENT	TEST
Density (kg/m^3) - prior to final cleaning - just prior to placing concrete	1017 *	Mud Weight (Density) API 13B-1 Section 1
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, salt water slurry may be used, and the allowable densities may be increased up to 32 kg/m^3.		

Construction

The Contractor shall submit a placing plan to the Engineer for approval prior to producing the test batch for cast-in-drilled-hole concrete piling and at least 10 working days prior to constructing piling. The plan shall include complete descriptions, details, and supporting calculations as listed below:

A. Requirements for all cast-in-drilled hole concrete piling:

1. Concrete mix design, certified test data, and trial batch reports.
2. Drilling or coring methods and equipment.
3. Proposed method for casing installation and removal when necessary.
4. Plan view drawing of pile showing reinforcement and inspection pipes, if required.
5. Methods for placing, positioning, and supporting bar reinforcement.
6. Methods and equipment for accurately determining the depth of concrete and actual and theoretical volume placed, including effects on volume of concrete when any casings are withdrawn.
7. Methods and equipment for verifying that the bottom of the drilled hole is clean prior to placing concrete.
8. Methods and equipment for preventing upward movement of reinforcement, including the Contractor's means of detecting and measuring upward movement during concrete placement operations.

B. Additional requirements when concrete is placed under slurry:

1. Concrete batching, delivery, and placing systems, including time schedules and capacities therefor. Time schedules shall include the time required for each concrete placing operation at each pile.
2. Concrete placing rate calculations. When requested by the Engineer, calculations shall be based on the initial pump pressures or static head on the concrete and losses throughout the placing system, including anticipated head of slurry and concrete to be displaced.
3. Suppliers' test reports on the physical and chemical properties of the slurry and any proposed slurry chemical additives, including Material Safety Data Sheet.

4. Slurry testing equipment and procedures.
5. Methods of removal and disposal of excavation, slurry, and contaminated concrete, including removal rates.
6. Methods and equipment for slurry agitating, recirculating, and cleaning.

In addition to compressive strength requirements, the consistency of the concrete to be deposited under slurry shall be verified before use by producing a test batch. The test batch shall be produced and delivered to the project under conditions and in time periods similar to those expected during the placement of concrete in the piles. Concrete for the test batch shall be placed in an excavated hole or suitable container of adequate size to allow for testing as specified herein. Depositing of test batch concrete under slurry will not be required. In addition to meeting the specified nominal penetration, the test batch shall meet the following requirements:

A. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be 2 hours or less, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50 mm or a slump of at least 125 mm after twice that time has elapsed.
B. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be more than 2 hours, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50 mm or a slump of at least 125 mm after that time plus 2 hours has elapsed.

The time period shall begin at the start of placement. The concrete shall not be vibrated or agitated during the test period. Penetration tests shall be performed in conformance with the requirements in California Test 533. Slump tests shall be performed in conformance with the requirements in ASTM Designation: C 143. Upon completion of testing, the concrete shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The concrete deposited under slurry shall be carefully placed in a compact, monolithic mass and by a method that will prevent washing of the concrete. Concrete deposited under slurry need not be vibrated. Placing concrete shall be a continuous operation lasting not more than the time required for each concrete placing operation at each pile, as submitted in the placing plan, unless otherwise approved in writing by the Engineer. The concrete shall be placed with concrete pumps and delivery tube system of adequate number and size to complete the placing of concrete in the time specified. The delivery tube system shall consist of one of the following:

A. A tremie tube or tubes, each of which are at least 250 mm in diameter, fed by one or more concrete pumps.
B. One or more concrete pump tubes, each fed by a single concrete pump.

The delivery tube system shall consist of watertight tubes with sufficient rigidity to keep the ends always in the mass of concrete placed. If only one delivery tube is utilized to place the concrete, the tube shall be placed near the center of the drilled hole. Multiple tubes shall be uniformly spaced in the hole. Internal bracing for the steel reinforcing cage shall accommodate the delivery tube system. Tremies shall not be used for piles without space for a 250-mm tube.

Spillage of concrete into the slurry during concrete placing operations shall not be allowed. Delivery tubes shall be capped with a watertight cap, or plugged above the slurry level with a good quality, tight fitting, moving plug that will expel the slurry from the tube as the tube is charged with concrete. The cap or plug shall be designed to be released as the tube is charged. The pump discharge or tremie tube shall extend to the bottom of the hole before charging the tube with concrete. After charging the delivery tube system with concrete, the flow of concrete through a tube shall be induced by slightly raising the discharge end. During concrete placement, the tip of the delivery tube shall be maintained as follows to prevent reentry of the slurry into the tube. Until at least 3 m of concrete has been placed, the tip of the delivery tube shall be within 150 mm of the bottom of the drilled hole, and then the embedment of the tip shall be maintained at least 3 m below the top surface of the concrete. Rapid raising or lowering of the delivery tube shall not be permitted. If the seal is lost or the delivery tube becomes plugged and must be removed, the tube shall be withdrawn, the tube cleaned, the tip of the tube capped to prevent entrance of the slurry, and the operation restarted by pushing the capped tube 3 m into the concrete and then reinitiating the flow of concrete.

When slurry is used, a fully operational standby concrete pump, adequate to complete the work in the time specified, shall be provided at the site during concrete placement. The slurry level shall be maintained within 300 mm of the top of the drilled hole.

A log of concrete placement for each drilled hole shall be maintained by the Contractor when concrete is deposited under slurry. The log shall show the pile location, tip elevation, dates of excavation and concrete placement, total quantity of concrete deposited, length and tip elevation of any casing, and details of any hole stabilization method and materials used. The log shall include a 215 mm x 280 mm sized graph of the concrete placed versus depth of hole filled. The graph shall be plotted continuously throughout placing of concrete. The depth of drilled hole filled shall be plotted vertically with the pile tip oriented at the bottom and the quantity of concrete shall be plotted horizontally. Readings shall be made at least at each 1.5 m of pile depth, and the time of the reading shall be indicated. The graph shall be labeled with the pile location, tip elevation, cutoff elevation, and the dates of excavation and concrete placement. The log shall be delivered to the Engineer within one working day of completion of placing concrete in the pile.

After placing reinforcement and prior to placing concrete in the drilled hole, if drill cuttings settle out of the slurry, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

If temporary casing is used, concrete placed under slurry shall be maintained at a level at least 1.5 m above the bottom of the casing. The withdrawal of casings shall not cause contamination of the concrete with slurry.

Acceptance Testing and Mitigation

Vertical inspection pipes for acceptance testing shall be provided in all cast-in-drilled-hole concrete piles that are 600 mm in diameter or larger, except when the holes are dry or when the holes are dewatered without the use of temporary casing to control ground water.

Inspection pipes shall be Schedule 40 polyvinyl chloride pipes with a nominal inside diameter of 50 mm. Each inspection pipe shall be capped top and bottom and shall have watertight couplers to provide a clean, dry and unobstructed 50-mm diameter clear opening from 1.0 m above the pile cutoff down to the bottom of the reinforcing cage.

If the Contractor drills the hole below the specified tip elevation, the reinforcement and the inspection pipes shall be extended to 75 mm clear of the bottom of the drilled hole.

Inspection pipes shall be placed around the pile, inside the outermost spiral or hoop reinforcement, and 75 mm clear of the vertical reinforcement, at a uniform spacing not exceeding 840 mm measured along the circle passing through the centers of inspection pipes. A minimum of 2 inspection pipes per pile shall be used. When the vertical reinforcement is not bundled and each bar is not more than 26 mm in diameter, inspection pipes may be placed 50 mm clear of the vertical reinforcement. The inspection pipes shall be placed to provide the maximum diameter circle that passes through the centers of the inspection pipes while maintaining the clear spacing required herein. The pipes shall be installed in straight alignment, parallel to the main reinforcement, and securely fastened in place to prevent misalignment during installation of the reinforcement and placing of concrete in the hole.

The Contractor shall log the location of the inspection pipe couplers with respect to the plane of pile cut off, and these logs shall be delivered to the Engineer upon completion of the placement of concrete in the drilled hole.

After placing concrete and before requesting acceptance tests, each inspection pipe shall be tested by the Contractor in the presence of the Engineer by passing a 48.3-mm diameter rigid cylinder 610 mm long through the complete length of pipe. If the 48.3-mm diameter rigid cylinder fails to pass any of the inspection pipes, the Contractor shall attempt to pass a 32.0-mm diameter rigid cylinder 1.375 m long through the complete length of those pipes in the presence of the Engineer. If an inspection pipe fails to pass the 32.0-mm diameter cylinder, the Contractor shall immediately fill all inspection pipes in the pile with water.

The Contractor shall replace each inspection pipe that does not pass the 32.0-mm diameter cylinder with a 50.8-mm diameter hole cored through the concrete for the entire length of the pile. Cored holes shall be located as close as possible to the inspection pipes they are replacing and shall be no more than 150 mm inside the reinforcement. Coring shall not damage the pile reinforcement. Cored holes shall be made with a double wall core barrel system utilizing a split tube type inner barrel. Coring with a solid type inner barrel will not be allowed. Coring methods and equipment shall provide intact cores for the entire length of the pile concrete. The coring operation shall be logged by an Engineering Geologist or Civil Engineer licensed in the State of California and experienced in core logging. Coring logs shall include complete descriptions of inclusions and voids encountered during coring, and shall be delivered to the Engineer upon completion. Concrete cores shall be preserved, identified with the exact location the core was recovered from within the pile, and made available for inspection by the Engineer.

Acceptance tests of the concrete will be made by the Engineer, without cost to the Contractor. Acceptance tests will evaluate the homogeneity of the placed concrete. Tests will include gamma-gamma logging. Tests may also include crosshole sonic logging and other means of inspection selected by the Engineer. The Contractor shall not conduct operations within 8.0 m of the gamma-gamma logging operations. The Contractor shall separate reinforcing steel as necessary to allow the Engineer access to the inspection pipes to perform gamma-gamma logging or other acceptance testing. After requesting acceptance tests and providing access to the piling, the Contractor shall allow 3 weeks for the Engineer to conduct these tests and make determination of acceptance if the 48.3-mm diameter cylinder passed all inspection pipes, and 4 weeks if only the 32.0-mm diameter cylinder passed all inspection pipes. Should the Engineer fail to complete these tests within the time allowance, and if in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in inspection, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

All inspection pipes and cored holes in a pile shall be dewatered and filled with grout after notification by the Engineer that the pile is acceptable. Placement and removal of water in the inspection pipes shall be at the Contractor’s expense. Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. The inspection pipes and holes shall be filled using grout tubes that extend to the bottom of the pipe or hole or into the grout already placed.

If acceptance testing performed by the Engineer determines that a pile does not meet the requirements of the specifications, then that pile will be rejected and all depositing of concrete under slurry or concrete placed using temporary casing for the purpose of controlling groundwater shall be suspended until written changes to the methods of pile construction are approved in writing by the Engineer.

The Contractor shall submit to the Engineer for approval a mitigation plan for repair, supplementation, or replacement for each rejected cast-in-drilled-hole concrete pile, and this plan shall conform to the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Prior to submitting this mitigation plan, the Engineer will hold a repair feasibility meeting with the Contractor to discuss the feasibility of repairing rejected piling. The Engineer will consider the size of the defect, the location of the defect, and the design information and corrosion protection considerations for the pile. This information will be made available to the Contractor, if appropriate, for the development of the mitigation plan. If the Engineer determines that it is not feasible to repair the rejected pile, the Contractor shall not include repair as a means of mitigation and shall proceed with the submittal of a mitigation plan for replacement or supplementation of the rejected pile.

If the Engineer determines that a rejected pile does not require mitigation due to structural, geotechnical, or corrosion concerns, the Contractor may elect to 1) repair the pile per the approved mitigation plan, or 2) not repair anomalies found during acceptance testing of that pile. For such unrepaired piles, the Contractor shall pay to the State, $400 per cubic meter for the portion of the pile affected by the anomalies. The volume, in cubic meters, of the portion of the pile affected by the anomalies, shall be calculated as the area of the cross-section of the pile affected by each anomaly, in square meters, as determined by the Engineer, multiplied by the distance, in meters, from the top of each anomaly to the specified tip of the pile. If the volume calculated for one anomaly overlaps the volume calculated for additional anomalies within the pile, the calculated volume for the overlap shall only be counted once. In no case shall the amount of the payment to the State for any such pile be less than $400. The Department may deduct the amount from any moneys due, or that may become due the Contractor under the contract.

Pile mitigation plans shall include the following:

A. The designation and location of the pile addressed by the mitigation plan.
B. A review of the structural, geotechnical, and corrosion design requirements of the rejected pile.
C. A step by step description of the mitigation work to be performed, including drawings if necessary.
D. An assessment of how the proposed mitigation work will address the structural, geotechnical, and corrosion design requirements of the rejected pile.
E. Methods for preservation or restoration of existing earthen materials.
F. A list of affected facilities, if any, with methods and equipment for protection of these facilities during mitigation.
G. The State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor's (and Subcontractor's if applicable) name on each sheet.
H. A list of materials, with quantity estimates, and personnel, with qualifications, to be used to perform the mitigation work.
I. The seal and signature of an engineer who is licensed as a Civil Engineer by the State of California.

For rejected piles to be repaired, the Contractor shall submit a pile mitigation plan that contains the following additional information:

A. An assessment of the nature and size of the anomalies in the rejected pile.
B. Provisions for access for additional pile testing if required by the Engineer.

For rejected piles to be replaced or supplemented, the Contractor shall submit a pile mitigation plan that contains the following additional information:

A. The proposed location and size of additional piling.
B. Structural details and calculations for any modification to the structure to accommodate the replacement or supplemental piling.

All provisions for cast-in-drilled-hole concrete piling shall apply to replacement piling.

The Contractor shall allow the Engineer 3 weeks to review the mitigation plan after a complete submittal has been received.

Should the Engineer fail to review the complete pile mitigation submittal within the time specified, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the pile mitigation plan, an extension of time commensurate with the delay in completion of the work thus caused will be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

When repairs are performed, the Contractor shall submit a mitigation report to the Engineer within 10 days of completion of the repair. This report shall state exactly what repair work was performed and quantify the success of the repairs relative to the submitted mitigation plan. The mitigation report shall be stamped and signed by an engineer that is licensed as a Civil Engineer by the State of California. The mitigation report shall show the State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor (and Subcontractor if applicable) name on each sheet. The Engineer will be the sole judge as to whether a mitigation proposal is acceptable, the mitigation efforts are successful, and to whether additional repairs, removal and replacement, or construction of a supplemental foundation is required.

MEASUREMENT AND PAYMENT (PILING)

Measurement and payment for the various types and classes of piles shall conform to the provisions in Sections 49-6.01, "Measurement," and 49-6.02, "Payment," of the Standard Specifications and these special provisions.

Full compensation for slurry, depositing concrete under slurry, test batches, inspection pipes, filling inspection holes and pipes with grout, drilling oversized cast-in-drilled-hole concrete piling, filling cave-ins and oversized piles with concrete, and redrilling through concrete, shall be considered as included in the contract prices paid per meter for cast-in-drilled-hole concrete piling of the types and sizes listed in the Engineer's Estimate, and no additional compensation will be allowed therefor.

10-3.09 CLOSED CIRCUIT TELEVISION SYSTEM

The closed circuit television (CCTV) system shall conform to all rules and regulations of the Federal Communications Commissions and shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

Prototype, rebuilt or reconditioned equipment will not be allowed.

The CCTV system shall consist of furnishing, installing, and testing on a system level: CCTV surveillance sites and CCTV positioning system. The Contractor, except for State-furnished video compression encoder/decoder (CODEC) and terminal adapter, shall furnish all items of the CCTV system.

The CCTV system shall be installed as a complete and operational system.

Testing of all CCTV System equipment shall be performed after installation as described elsewhere in these special provisions.

All components of the CCTV system shall operate at 117 V(ac) ± 10 percent at 60 Hz.

All components of the CCTV positioning system, cameras, shall have a minimum 2-year manufacturer's warranty for parts and labor.

All components of the CCTV positioning system shall be able to withstand a vibration of 5 to 30 Hz with 0.76 mm total excursion, from 60 to 1000 Hz, with peak random vibrations of 5 gravities without damage or degradation. All components of the CCTV positioning system shall be able to withstand a shock of 5 gravities in any axis, under non-operating conditions.

Each section of equipment intended for the same purpose shall be the same make, model, and manufacturer.

The Contractor shall provide 5 sets of documentation containing complete specifications and operation details of each of the components of the CCTV positioning system. The documentation shall also include wiring diagrams showing wire colors, functions, and pin assignments for connecting these components.

CLOSED CIRCUIT TELEVISION SURVEILLANCE SITE

Each CCTV Surveillance site shall consist of providing service, furnishing and installing a CCTV positioning system, a camera pole, Model 334 cabinet, a camera control unit, interconnect cables and wiring, installing a State-furnished video CODEC and terminal adapter, and other required equipment as shown on the plans. Testing of all CCTV site equipment shall be performed after installation as described elsewhere in these special provisions.

CAMERA CONTROL UNITS

Environmental

Each CCU shall operate in an environment of -20°C to +60°C ambient temperature.

Each CCU shall conform to MIL-STD-810D-516.1 and MIL-STD-810D-514.1 shock and vibration test.

Camera remote control functions: The unit shall provide, as a minimum, control and drive circuits for the following functions:

Pan left, Pan right
Tilt up, Tilt down
Zoom in, Zoom out
Focus near, Focus far
Manual and auto iris control
Iris open, Iris close
Zoom and focus position preset
Manual and remote control switch

In addition the following conditions shall be controllable from the traffic operations center:

DSP camera (additional functions)
Electronic zoom range
Electronic shutter selection
Auto/manual integration control and period selection
Remote white balance control
Variable speed pan and tilt control functions
64 pan and tilt preset position

Communication Ports

There shall be 2 communications ports; one for connecting the CCU with the Central Command center and the second one for connecting the positioning system to the CCU. Both ports are EIA422.

Power input

115 V(ac) ± 10 percent, 60 Hz ± 3 Hz, 40 W maximum.

Connectors

Connectors shall be provided and installed which are compatible with the communications equipment interface. All connector pins and mating connectors shall be plated to ensure good electrical connection and resist corrosion. Pressure tight multi-conductor MS-type cable connectors shall be used for camera connections.

CLOSED CIRCUIT TELEVISION POSITIONING SYSTEM

The CCTV positioning system shall consist of an environmental enclosure assembly, color camera assembly, a pan and tilt assembly, and a transformer assembly and a composite cable. All CCTV positioning system subassemblies shall be furnished and installed by the Contractor.

The Contractor shall fully assemble each CCTV positioning system and shall make all the necessary adjustments on different subassemblies of the CCTV positioning system. This includes the back-focus and tracking adjustments on the lens and color balancing of the camera.

The camera assembly shall have all necessary wiring, cables and connectors. All camera assemblies shall be plug compatible and interchangeable such that technicians can exchange camera assemblies in the field.

The Contractor shall perform a functional test to verify that the assembly works in accordance with the manufacturer's specifications before installing the assembly. The Contractor shall provide details of the camera and operational elements to the Engineer with the material submittals.

ENVIRONMENTAL ENCLOSURE ASSEMBLY

The environmental enclosure assembly shall be made up of environmental enclosure with sun shroud in which the color camera assembly shall be installed. The pan and tilt assembly shall be made up of a pan and tilt unit and an integrated receiver/driver. The environmental enclosure assembly shall be secured to the pan and tilt assembly. The CCTV positioning system shall be mounted on the camera pole mounting plate and properly secured. The CCTV positioning system shall be installed such that the camera viewing coverage is optimized as directed by the Engineer.

Environmental Camera Enclosure

The Contractor shall furnish and install a corrosion resistant and tamperproof sealed and pressurized enclosure with 34.5 kPa dry nitrogen. The enclosure shall have a Schrader valve for pressurization and 138 kPa relief valve.

The camera assembly/enclosure shall be assembled and tested and configured only by the camera manufacturer at the camera manufacturer facility. The camera shall have been adjusted for color balance and lens tracking/focus, and all configurable items shall have been properly set per specifications. Camera assembly/enclosure delivered to the project site shall be accompanied with a written certification of assembly and configuration from the camera manufacturer. This certification shall serve as manufacturer’s documentation that the assembly and configuration of the camera assembly/enclosure equipment was performed. A sample certification document shall be furnished as part of the materials submittal data.

The enclosure shall be constructed from 6061-T6 standard aluminum tubing with a wall thickness of 3.5 mm ± 0.76 mm. Internal components shall be mounted to a rail assembly. A copper plated spring ring shall be used to ensure electrical bonding of the rail assembly and components to the camera enclosure.

The enclosure exterior shall be finished by pre-treatment with a conversion coating and baked enamel paint.

The environmental camera enclosure shall be designed to withstand the effects of sand. dust, and hose-directed water. All connections shall be watertight.

Internal wiring shall be properly labeled. A gas-tight connector shall be used at the rear plate of the housing. Wiring to the connector shall be sealed with silicon or potting compound.

The internal humidity of the housing shall be less than 10 percent, when sealed and pressurized. Desiccant packs shall be securely placed inside the housing to absorb any residual moisture and maintain internal humidity at 10 percent or less. A humidity indicator with a range from less than 10 percent to greater than 30 percent shall be installed inside the housing. It shall be easily viewable through the housing faceplate.

The viewing window shall be constructed in such a way that unrestricted camera views can be obtained at all camera and lens positions.

A sun shield shall be provided to shield the entire environmental camera enclosure from direct sunlight. It shall be constructed in such a way as to allow the free passage of air between the environmental camera enclosure and the shield, but shall not form a "sail" to place an excessive load on the positioning system.

Each environmental camera enclosure shall be provided with an internal 24 V(ac), 5 W low temperature heater with its own thermostat control.

Mechanical Specifications

Weight: 1.9 kg.

Dimensions: Length (less connectors): 304.8 mm; Housing Diameter: 88.9 mm; Height (Including mounting base): 130.3 mm.

Mounting: 4 mounting nuts on bottom of base.

Environmental Specifications

Ambient Temperature Limits (Operating): -40°C to 60°C.

Ambient Temperature Limits (Storage): -30°C to 70°C.

Humidity: Up to 100 percent relative humidity (per MIL-E-5400T, paragraph 3.2.24.4)

Other: Withstands exposure to sand, dust, fungus, and salt atmosphere per MIL-E-5400T, paragraph 3.2.24.7, 3.2.24.8, and 3.2.24.9.

COLOR CAMERA ASSEMBLY

The color camera assembly is made up of a Digital Signal Processing (DSP) color camera unit with a built in motorized zoom/focus/iris lens. The color camera assembly shall be installed as one fully operational unit and properly fit into the environmental enclosure assembly.

DSP video camera unit shall be of dual mode, day (color) and night (monochrome) with optical zoom lens enclosed solid state design, and shall meet the following requirements:

Electrical Specifications

1. Imager: Interline transfer progressive scan micro-lens CCD with mosaic-type color compensating filter.
2. Image Area: 3.6 mm (H) x 2.7 mm (V) [6.25 mm format].
3. Resolution: NTSC - 470 horizontal; 350 vertical.
4. Optical Zoom Range: 23X, 3.6 mm to 82.8 mm.
5. Digital Zoom Range: 1X (Off) through 10X.
6. Effective Digital Focal Length: 82.8 mm to 828 mm.
7. Optical Zoom Speed: Three speeds, from approximately 2.9 seconds to 5.8 seconds.
8. Horizontal Angle of View: Optical: 54° to 2.5°; at 10X Digital: 54° to 2.5°.
9. Minimum Focus Distance: 10.16 mm at max. wide; 1016 mm at max tele.
10. Auto Focus: Selectable Auto/Manual. Minimum scene illumination for reliable auto focus, 30 percent video.
11. Manual Focus Speed: Three adjustable speeds, approximately 2.5 seconds to 8.5 seconds.
12. Zoom and Focus Presets: 64 preset positions (Note: recalling a preset position puts camera into manual focus mode).
13. Long Term Integration Range: Provides manual/auto selection of integration duration for enhanced sensitivity. Integration times are 1/2 second, 1/4 second, 1/8 second, 1/15 second, 1/30 second. Frame store video output provides continuous video output, updated at the integration rate.
14. Manual Shutter: Selectable shutter speeds of 1/60; 1/100; 1/250; 1/500; 1/1000; 1/2000; 1/4000; 1/10 000, 1/30 000 second.

15. Auto Shutter: Automatically controls shutter speed between 1/60 (1/50 PAL) and 1/10 000 second to maintain correct video level output.

16. Auto Iris: Iris automatically adjusts to compensate for changes in scene illumination to maintain constant video level output within sensitivity specifications.

17. Manual Iris: The effect of the open iris/close iris shall be done by changing the video level. To give the effect of open iris, a decrease in the video level value shall change and to give the effect of close iris, an increase in the video level value shall change. The video level value shall range from 1 to 256 in the auto-iris mode the video level is set at it's default mode.

18. Gamma: 0.45.

19. AGC: 0 to 28 dB.

20. White Balance:

    Auto: Lets the camera adjust to "White" as defined by factory settings to maintain less than 10 IRE of unbalance from 2850 to 5100K.

    Set: Allows user to set "white" as preferred. For instance, the camera could be focused on an "Off White" scene and "Set" to white balance. The camera will then automatically track color temperature changes, biasing the auto white balance on the "Off White" instead of the factory defined "white".

    Lock: Locks the white balance at the current levels.

    Indoor: Sets the "White" to be consistent with 3200K.

    Outdoor: Sets the "White" to be consistent with 5100K.

    Fluorescent: Sets the "White" to be consistent with fluorescent lighting.

21. Signal to Noise Ratio: 56 dB (HPF: 200 kHz; LPF: 6 MHz; weighted, minimum camera gain, lens capped).

22. Video Output: NTSC or PAL, 1 V p-p at 75 Ω, unbalanced.

23. Synchronization: Phase-adjust line lock on 60 Hz.

24. Sensitivity: (3200K):

    Full video, AGC off, iris at f/1.6, shutter at 1/60:
    110 lux scene illumination (8.5 lux faceplate illumination).

    80 percent Video, AGC on:, Iris at f/1.6, shutter at 1/60:
    10 lux scene illumination (0.8 lux faceplate illumination).

    30 percent Video, AGC on, Iris at f/1.6, shutter at 1/60:
    2 lux scene illumination (0.16 lux faceplate illumination).

    30 percent Video, AGC on, 1/4-second integration:
    0.125 lux scene illumination (0.01 lux faceplate illumination).

    Note 1: Scene illumination is based on 100 percent reflectance.

25. Programmable I.D. Generator and Alarm Messages:

    ID characters are white with a black border, 18 TV lines in height.

    Text can be displayed in uppercase characters.

    Camera Identification: Up to 2 lines, each 24 characters long.

    Preset ID: 1 line, up to 24 characters long, user programmable for each of the 64 preset positions. When a preset position is recalled the corresponding preset ID shall be displayed. The preset ID shall remain displayed until a zoom, manual focus, auto focus select, or another preset command is received.

    Low Pressure Indicator: 1 line "Low Pressure", message can be displayed in "blinking" mode and be displayed when activated by low pressure. Adjustable set points by altitude shall be provided via the serial port to activate low pressure. Message shall be enabled or disabled.

    Internal Temperature Indicator: 1 Line, in degree C numeric message can be displayed in "blinking" mode. Message shall be enabled or disabled.

    Alarm Inputs 1 and 2: 1 line numeric message can be displayed in "blinking" and shall be enabled or disabled.

26. Communication and Camera Addressing Protocol: RS-422/RS232 optically isolated serial communication protocol shall be public domain.
27. Camera Power Input Requirements: 24 V(ac) 50/60 Hz. (±10 percent).
28. Heater Power Input Requirements: 24 V(ac) 50/60 Hz. (±10 percent).
29. Power Consumption: 7 W – Heater off; 27 W – Heater on.

PAN AND TILT ASSEMBLY

The Contractor shall furnish and install an environmental pan and tilt assembly, which integrates a pan and tilt unit and a receiver/driver into one package at each CCTV Surveillance site on top of the camera pole. The integrated receiver/driver, contained within the pan and tilt unit, communicates with COHU protocol control messages and can control Digital DSP camera control functions. All camera and pan and tilt functions are operable via RS-422 serial communications. The Contractor shall be responsible for providing any mounting adapter or attachment required to install the pan-and-tilt positioning unit. The mounting shall be designed for the camera housing and the pan-and-tilt unit to withstand the wind loading as specified in the plans.

The positioning system shall receive the command data from the camera control unit or the remote central command center and decode the digital command data signals transmitted through the communication transmission interface, perform error checking and act on valid data to drive the pan and tilt unit and the camera control functions. The integrated receiver/driver shall retain up to 64 user-programmed preset positions when power is removed.

Integrated receiver and driver address

Each unit shall have a unique address, which is changeable by a serial port, and can be set from the traffic operations center. The unit shall respond to the central command only if it is addressed.

The positioning system shall interface to the communications backbone through the EIA422 command port. A minimum 9600 baud data rate shall be used. Data shall be sent asynchronously as either 8 bit with no parity.

Communications Ports

There shall be two communications ports; one EIA422 for communication between the positioning system and the CCU and central command center, one EIA232, embeded into the integrated receiver driver for communication between the receiver/driver and the camera assembly.

A video coaxial cable with a male BNC shall be furnished and installed by the Contractor.

The positioning system shall provide the following:

Variable Speed – high speed stepper motor technology
Standard pan and tilt speeds are 40 degrees per second in pan and 20 degrees per second in tilt
Pan preset speed of 100 degrees per second in 80 km/h winds
Pan preset speed of 60 degrees per second in 145 km/h winds
Pan range is 360 degrees and +40 to –90 degrees from horizontal and operates 115 V(ac)
64 preset positions with accuracy of one-half degree
Electronic pan limit stops
Integrated Receiver/Driver
Small size (254 mm x 203.2 mm)
Light weight (12.7 kg)
RS-422 serial control
IP 66 ratings

The Contractor shall furnish and install a pan and tilt assembly, an environmental camera enclosure assembly, a CCTV assembly that would be locally (by the CCU),or remotely, (by the central command center) activated/deactivate DSP camera, lens and pan and tilt functions. The protocol and message structure for the integrated receiver/driver and CCTV camera assembly shall be common for all positioning systems. No proprietary protocol and message structure shall be used. In order to assure compatibility, the environmental camera enclosure, camera assembly, pan and tilt assembly and transformer assembly shall be made by the same manufacturer.

The integrated receiver driver shall have a built-in programmable electronic circuit character generator capable of superimposing a written camera identification message over the video display. The identification shall be programmable up to 24 characters per line, 2 lines, and 3 alarm messages that can either be displayed, or flash every second, upon an alarm trigger. Text characters shall be white with black border 28 horizontal TV lines in height. The camera I.D. shall be input via a separate EIA232 controller connector, or from the traffic operations center. The character generator shall also superimpose a message indicating that the camera pressure is low if pressure in the enclosure drops below 1406.1 kg/m^2 and below.

The pan and tilt assembly design shall be compatible with the environmental camera enclosure and camera assemblies. All electrical wiring and communication and video cables shall enter through the bottom of the pan and tilt assembly. The Contractor shall mount the environmental camera enclosure to the pan and tilt assembly as recommended by the manufacturer.

The Contractor shall provide all necessary brackets, mounting flanges, cable terminations, terminal blocks, video connectors/adapters and auxiliary materials required to connect the pan and tilt assembly to the camera pole's mounting plate, the CCTV camera assembly and the camera control unit.

TRANSFORMER ASSEMBLY

The transformer assembly shall be integral to the positioning system. The transformer shall have an input range of 90 V(ac) to 135 V(ac) with a nominal operating voltage of 120 V(ac) at 60 Hz. The transformer shall be a step down transformer with a primary input of 120 V(ac) and a secondary of 24 V(ac), nominal, with a 60 VA rating.

TESTING AND DOCUMENTATION

The Contractor shall conduct tests of the individual components of the CCTV system in accordance with specifications and these special provisions.

Prior to conducting any tests the Engineer will provide to the Contractor detailed test procedures to be completed by the Contractor.

Documentation of all test results shall be provided to the Engineer for review and approval. System documentation shall incorporate the test results for ongoing maintenance and performance measurements.

The Contractor shall be responsible for all deliveries.

FACTORY TESTS

All CCTV assemblies and communication equipment furnished by the Contractor shall be tested and subjected to a nominal 48-hour burn-in period at the factory. The factory tests shall be in accordance with equipment manufacturer's standard procedures and quality assurance program.

The Contractor shall provide the Engineer with a copy of the manufacturer's test procedures and quality assurance procedures for information. If the Engineer determines that these procedures are not adequate, the Engineer may require that additional tests be conducted by the Contractor prior to installation. Additional testing ordered by the Engineer will be paid for as extra work, as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

The Contractor shall provide documentation certifying that each item supplied has passed factory inspection and testing.

PRE-INSTALLATION TESTS

Prior to installation, the Contractor shall conduct pre-installation tests to be observed by the Engineer on all equipment to be used for this project.

Camera, Lens, Weatherproof Enclosure, Pan and Tilt Unit

The Contractor shall conduct pre-installation tests on all of the CCTV assemblies. These tests shall demonstrate the correct operation of the camera, lens, and weatherproof enclosure at all focal lengths and ambient light levels.

The Contractor shall conduct pre-installation tests on all of the pan and tilt units. These tests shall demonstrate the correct operation of the pan and tilt units. The positioning system shall move smoothly in both horizontal and vertical directions. The pan and tilt stops shall be adjusted such that the camera viewing coverage of the freeway is optimized as directed by the Engineer.

POST INSTALLATION TESTS

The Contractor shall test each item after installation to ensure that the equipment has been installed without damage and operates correctly.

Closed Circuit Television Surveillance Site Tests

The Contractor, after installation of each color CCTV assembly on the pan and tilt assembly shall verify the correct operation of the camera, lens, pan and tilt unit, and the weatherproof enclosure accessories from the cabinet station. These tests shall be conducted using test panels and equipment furnished by the Contractor. These tests shall include the following:

Viewing video images as the lens focal lengths and apertures of the lens is varied. The Contractor shall verify that the camera is focused after each change.

Verifying the correct operation of the auto iris, power zoom, and imager protection features.

Verifying the correct operation of the pan and tilt unit. The pan and tilt stops shall be such that the camera viewing coverage of the freeway is optimized as directed by the Engineer.

Transportation Management Center (TMC) Location Tests

The Contractor, after installation of the closed circuit television system, shall verify the correct operation of the Positioning system from the TMC location. These tests shall include the following:

Viewing video images as the lens focal lengths and apertures of the lens is varied from the Master Control Panel. The Contractor shall verify that the camera is focused after each change.

Verifying the correct operation of the auto iris, power zoom, and imager protection features from the Master Control Panel.

Verifying the correct operation of the pan and tilt unit from the Master Control Panel.

FINAL SYSTEM TESTS

In the presence of the Engineer, the Contractor shall conduct a final test of the CCTV system to verify the system is complete and fully operational. The Contractor shall conduct end to end performance tests on the CCTV system. These tests shall confirm the functional operation of all elements of the system, including both State and Contractor furnished items.

These tests shall confirm the correct operation of each camera, lens, monitor, pan and tilt unit, video CODEC and all other elements of the system.

Each camera shall be tested to measure the video signal received using a NTSC waveform monitor. The testing shall confirm video levels and signal to noise ratio specification compliance for daytime and nighttime operation at each of the CCTV system locations and the TMC location. The pan and tilt units shall be functionally tested over 350 degrees in the horizontal plane and ±90 degrees in the vertical plane or as directed by the Engineer. Functional testing shall also confirm specification compliance for the lens operation, the auto and manual iris control, the video CODECs, the camera control units, and the monitors.

DOCUMENTATION

The Contractor shall provide documentation containing complete details of how the final system is actually configured, including theory of operation, together with complete operating and maintenance information. All data shall be submitted on 560 mm x 910 mm sheets or 216 mm x 280 mm sheets in loose leaf bound manuals, as appropriate.

The Contractor shall provide a complete set of communication protocols, timing diagrams and all other operational information as applicable for the CCTV system prior to the start of work. This shall include, but is not limited to, the protocols and timing diagrams of the bi-directional communication link between the existing Master Camera Control and the camera control unit. Complete documentation shall be delivered at least 15 days prior, and approved at least 7 days prior (unless otherwise approved by the Engineer), to conducting any training sessions and/or acceptance tests.

The general requirements for documentation of major system components are as follows:

General description of the system
Overview of operation
System and subsystem block diagrams
Functional data flow diagrams
Physical organization of system
Overall system specifications
Manufacturer's handbooks for equipment.

Detailed description shall be provided on the following:

Operating procedures including start-up, shut-down, restart, and other recommended procedures to ensure satisfactory performance of the system.

Video and communications equipment including layouts, cabling, wiring, controllers, modems, schematics, parts lists, etc.

Documentation shall be grouped into two main categories:

1. System Operation Manual, with 5 copies supplied, shall include, but not limited to, the following items:

   As-built documentation - factory settings
   System test results
   Equipment model/serial numbers and options
   System schematic
   Recommended routine maintenance
   Recommended maintenance program
   System diagnostic procedures
   Results of all system tests performed
   Completed warranty cards

2. Individual Operation and Maintenance Manuals shall be provided for each piece of equipment (one per each individual unit supplied). The Operation and Maintenance Manual shall include, but not limited to, the following items:

   Specifications
   Design characteristics
   General operation theory
   Function for all controls
   Trouble shooting procedure (diagnostic routine)
   Block circuit diagram
   Geographical layout of components
   Schematic diagrams
   List of replaceable component parts with stock numbers.

Corrections shall be made within 15 calendar days after discovery of an error and shall be at no cost to the State.

The State shall have the right or option to reproduce copies of all documentation provided by the Contractor hereunder, provided that such reproduction is solely for the use of the State or its designated representatives.

10-3.10 TRAFFIC MONITORING STATION

This work shall consist of installing microwave vehicle detection sensor system(s) (MVDS) in conformance with these special provisions.

Materials List and Drawings- A list of materials which the Contractor proposes to install for the MVDS systems together with the drawings and other data shall be submitted to the Engineer in conformance with the provisions in Section 86-1.04, "Equipment List and Drawings," of the Standard Specifications.

The following shall be included in the documentation before the completion of the contract:

Certificate of Compliance- The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer, in conformance with the provisions of Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall certify that the selected MVDS equipment model is suited for the use detailed in this specification and fully compliant with the requirements of these specifications. The certificate shall also include a report, on the final installed configuration of the individual MVDS systems, reviewed and approved by the manufacturer.

Lane Configuration- The documentation shall include a projection of the microwave beam and resulting lane coverage (beam footprint) that demonstrates the correlation of the physical road lane assignments with the configuration zone assignments. This documentation will be used by the State to decode the MVDS transmitted information into coherent data. The Engineer shall determine the acceptability of the documentation, and approval of the documentation at his/her discretion.

Calibration Programming- The Contractor shall provide the calibration, tuning, alignment, and other programming and documentation on a Windows 2000/NT compatible Compact Disk (CD). The information provided shall be formatted in such a manner that the files can easily be matched with the equipment calibrated or aligned. This documentation shall contain files that allow replacement equipment to be loaded with the same configuration.

Acceptance Testing Documentation- The Contractor shall provide any and all documentation that is required to utilize the support equipment. The documentation shall be organized in such a manner that the Engineer will be able to perform acceptance testing using the documentation alone, without assistance from the Contractor or sub-Contractors.

Mounting and Wiring Information- One set of the approved detailed diagrams for each MVDS system, that includes wiring and service connections, shall be covered separately on each side with clear self-adhesive plastic and placed in a heavy-duty plastic envelope. The envelope shall be attached securely to the inside of the NEMA 3R enclosure door or at a location designated by the Engineer.

Communication Protocol - A document shall be provided that fully defines the unit's open communication protocol (message structure as well as all information necessary to make use of such messages available and in the public domain) and all information necessary for operating the system from a remote Windows 2000/NT based Personal Computer (PC).

FUNCTIONAL REQUIREMENTS

A single MVDS unit shall emulate the detection response of 1.8 m wide and 1.8 m long inductive loop detectors that sense vehicles traveling in up to eight lanes of traffic simultaneously. Each MVDS unit shall provide one zone per lane, within each beam footprint, as well as provide contact outputs, when required, that emulate dual loops with a 6 m separation. The unit shall detect vehicles as close as 3 m and up to 60 m. The MVDS unit shall be able to accurately monitor traffic lanes in the presence of barrier railings, guardrails and other obstacles separated from traffic lanes by a minimum of 3 m and as long as 50 percent or more of the vehicle is visible to the MVDS.

During all weather conditions and for vehicle traveling at speeds of 10 km/h to 160 km/h, with up to eight lanes of detection the MVDS shall have following minimum performance accuracy:

A. Overall roadway volume of better than 97 percent.
B. Vehicle volumes per lane of better than 95 percent.
C. Overall average speed and occupancy of better than 95 percent.

The MVDS shall continue to report greater than 50 percent occupancy when vehicles are stopped for up to 15 minutes.

The MVDS shall have an EIA -232 or EIA -485 communication port that will support data via a non-proprietary communication protocol. This MVDS communication protocol shall be completely defined per the Interface Requirements DI-IPSC-81434 dated April 1989 and all identified optional requirements shall be normative. The defined protocol shall be suitable for both wireline or wireless transmission using industry standard communication schemes such as Cellular Digital Packet Data protocol and Plain Old Telephone service. The serial output shall support summary data aggregated at user defined intervals of 10 seconds to 10 minutes with the accuracy noted in the previous paragraph.

The Contractor shall be responsible for the compatibility and adjustment of all components in conformance with provisions in "Testing Requirements" of these Special provisions.

TECHNICAL REQUIREMENTS

The MVDS system shall be FCC certified under Part 15, Subpart C, Section 15.250 for low-power, unlicensed, continuous radio transmitter operation. The Contractor shall assure that the MVDS system will not cause harmful interference to radio communication in the area of installation. If the operation of the MVDS system causes harmful interference, the Contractor shall correct the interference at the Contractor's expense.

The MVDS sensor unit shall be encased in a NEMA 3R or better rated enclosure, pole mounted and directed perpendicular to the flow of traffic lanes as shown on the plans. The MVDS sensor unit shall not exceed 250 mm x 250 mm x 355 mm in size and shall not weigh more than 5 kg. The MVDS shall operate over a temperature range from –30˚C to +70˚C, with up to 95 percent relative humidity.

The Contractor shall provide all necessary interface modules and associated equipment to deliver the specified performance. All circuit cards or assemblies installed in the controller shall conform to the requirements detailed in Chapter 1 of the Transportation Electrical Equipment Specifications (TEES).

All circuits that have field wire connections leaving the detector enclosure shall include transient protection that complies with IEEE Standard 587-1980 Category C.

All wiring to the MVDS shall be low voltage, 24 volts or less, and the sensor shall draw less than 10 watts of power. The MVDS shall have an orderly recovery after a power failure that automatically restores normal operation without introducing erroneous data or requiring manual intervention. MVDS sensors shall maintain the configuration and calibration information in memory while powered off for at least 90 days.

The Contractor shall provide and connect all necessary power supplies and transformers to operate from 110 V(ac) +10 percent /-15 percent. The power supply or transformer used for the MVDS shall meet the following minimum requirements:

	Power Supply	Transformer
Power Cord	Standard 120 V(ac), 3 prong cord, at least 1 meter in length (may be added by Contractor)	Standard 120 V(ac), 3 prong cord, at least 1 meter in length (may be added by Contractor)
Type	Switching mode type	Class 2
Power Rated	40 W minimum (no minimum load req)	40 W minimum
Operating Temperature	From -30°C to +70°C	From -30°C to +70°C
Operating Humidity Range	From 5 percent to 95	From 5 percent to 95
Input Voltage	From 85 V to 120 V(ac)	From 85 V to 120 V(ac)
Input Frequency	From 85 V to 120 V(ac)	From 85 V to 120 V(ac)
Inrush Current	Cold start, 25 A max. at 115 V	N/A
Output Voltage	As required by the MVDS	As required by the MVDS
Overload Protection	From 105 percent to 150 percent in output pulsing mode	Power limited at >150%
Over Voltage Protection	From 115 percent to 135 percent of rated output voltage	N/A
Setup, Rise, Hold Up	800 ms, 50 ms,15 ms at 115 VAC	N/A
Withstand Voltage	I/P-0/P:3 kV, I/P-FG:1.5 kV, for 60 sec.	I/P-0/P:3 kV, I/P-FG:1.5 kV, for 60 sec
Working Temperature	70°C at 30%	70°C at 30%
Safety Standards	UL 1012, TUV EN60950	UL 1585
EMC Standards	EN55022 Class B, EN61000-4-2, 3, 4, 5 and EN61000-3-2, 3	N/A

All equipment and parts shall be furnished new, be of the latest proven design, standard manufacture and in conformance with the manufacturer's requirements. This includes all support equipment required by the Engineer for acceptance testing of the MVDS unit(s). No substitutions of materials shall be allowed that deviate from the list of materials approved by the Engineer. The date of manufacture, as shown by date codes or serial numbers of electronic circuit assemblies, shall not be older than six months from the scheduled start date of this installation. Equipment models shall have been fully tested and in standard production for a minimum of three months. System elements shall be designed to operate continuously in an outdoor traffic monitoring and control environment, 24 hours a day. Manufacturing quality and all electronic components shall support a minimum mean time between failure (MTBF) of ten (10) years.

INSTALLATION REQUIREMENTS

The microwave vehicle detection sensor (MVDS) system shall, at a minimum, include the microwave detector unit, enclosures, connectors, cables, junction box, mounting equipment and hardware, controller interface boards and assemblies, local and remote software, firmware, power supply units and all other support, calibration, and test equipment.

Proper placement, mounting height and orientation of the MVDS systems are critical to the overall performance and accuracy of the systems and shall conform to the manufacturer's published requirements for the system provided. The MVDS units shall be installed as shown on the plans. The Contractor is responsible for analyzing each proposed pole location to assure that the detector installation will comply with the manufacturer's published installation instructions. The Contractor is also responsible for advising the Engineer, before any trenching or pole installation has taken place, of any need to move the pole from the location indicated in the plans in order to achieve the specified detector performance. The Contractor shall confirm equipment placement with the manufacturer before installing any equipment.

Alignment, configuration and any calibration of the MVDS shall take less than 15 minutes per lane once mounting hardware and other installation hardware are in place. MVDS units shall be installed such that each unit operates independently and that detectors not interfere with other MVDS units or other equipment in the vicinity.

Each MVDS unit shall be supplied with a connectorized MVDS cable harness with appropriate cable length for each installation. One continuous wire run is required. No splices are allowed between the detector and controller cabinet. The connector shall be a standard Mil Type and rated plug. MVDS cable shall, as a minimum, consist of 3 twisted pairs for EIA -232/ EIA 485 data communications and power. The MVDS may generate contact outputs in the detector or in a module attached to the EIA 485 bus. Whenever contact outputs are required for a controller based installation and the unit generates these outputs at the detector, the cable shall include one twisted pair for each zone depicted on the plans plus two twisted pairs for future zones with an overall shield and copper drain wire. Conductors shall be 18 gage with 19 tinned copper strands, with a minimum of 0.30 mm PVC insulation rated for 300 V at 105^0C. The outer jacket shall be chrome PVC with minimum thickness of 1.35 mm and the outside diameter of the cable shall not exceed 19.2 mm.

The Contractor shall wire the MVDS power conductors to DIN rail mounted terminal blocks in the NEMA 3R enclosure or as directed by the Engineer. The EIA -232 / EIA -485 serial data communication output conductors shall be terminated to a DB9F connector for setup and diagnostic access. The ends of all unused and spare conductors shall be coiled and taped to prevent accidental contact to other circuits. All conductors inside the NEMA 3R enclosure shall be labeled for the functions as depicted in the approved detailed diagrams.

TESTING REQUIREMENTS

Support Equipment- The Contractor shall provide, as part of the MVDS system, any and all calibration equipment that may be required to setup, calibrate, verify performance and maintain the MVDS system. The Contractor shall provide the Engineer with at least two spares of any special tools needed for the installation, acceptance testing, operation and maintenance of the MVDS.

Software- The Contractor shall provide any and all programming and software required to support the MVDS system. The programming and software shall be installed in the appropriate equipment at the time of acceptance testing, and shall be used in the acceptance testing.

Methodology- The Contractor shall, in the presence of the Engineer, verify the performance of each unit individually and submit the recorded medium and other materials to the Engineer at the conclusion of the test. The accuracy of each unit shall be determined and documented in such a manner that the unit may be analyzed and approved or rejected separately. Failure to submit the materials at the conclusion of testing invalidates the test. The recorded media serves as acceptance evidence and shall not be used for calibration. The calibration shall have been completed prior to testing and verification.

Acceptance Notification- The Contractor shall notify the Engineer 10 working days before the unit is ready for acceptance testing. If cancellation or postponement of the test is necessary for any reason, an additional 10-day notification shall be required for rescheduling.

Acceptance Preparation- The Contractor shall provide equipment, software, documentation, support equipment, and any other materials, personnel and devices that may be required for the acceptance testing. The scheduling for the testing shall be so that testing shall be accomplished before the end of the normal work shift. If the testing period extends beyond the normal work shift or beginning peak hours, the Engineer may cancel the testing for that day and reschedule for another day and invalidate the test. If the Contractor schedules testing, but fails to provide the necessary material for the testing within one hour of the scheduled testing start time, the Engineer may cancel the testing for that day and reschedule for another day. If the testing is cancelled due to the Contractor's failure to provide the required materials, the Contractor shall reimburse the State for costs associated with the testing.

Comparison method- Accuracy of the MVDS system shall be verified by counting vehicles recorded on DVD or CD media in MPEG2 format and viewed on a Windows 2000/NT operating system based PC. The recording device shall be located so that all lanes of traffic are visible and be oriented to minimize manual counting errors. The Contractor shall provide a means for synchronizing the test start and ending times or provide software that displays MVDS data along with the images of moving vehicles.

Testing and accuracy criterion- The test shall take place during a period when the traffic flow rate exceeds a minimum 1500 vehicles per hour in any lane. The recording period shall be a minimum of 30 minutes and count a minimum of 100 vehicles for every lane. The total vehicle count for every lane shall be used including the first and last vehicles for each lane, even if the precise timing of these vehicles cannot be determined. Errors in the start and finish of the MVDS and manual counts are included in the specified performance criterion.

Accuracy of the MVDS unit count shall be compared to counts of vehicle traffic in typical traffic conditions. Types of vehicles are not relevant to the test as long as the vehicles are licensed for use on State roads. The data accuracy shall be determined by the formula 100{1-[(TC-MC)/TC]} where TC= Traffic Count derived from the media recording, MC = MVDS reported count over the same period of time, and where the resulting fraction [ ] is expressed as an absolute value.

The observed MVDS volume accuracy shall be equal to or better than the following:

Minimum acceptable accuracy for:	Number of Detection Lanes	
	4 lanes or Less	5 lanes or more
Any Lane	95%	95%
Roadway	97%	95%

Processed data- The Engineer shall review the data findings and accept or reject the results within seven working days. Determination of any vehicle anomalies or unusual occurrences shall be decided by the Engineer. If the acceptance or failure depends on disputed counts or vehicles, then the unit shall be found to have failed the test. The burden of proof for acceptance is on the Contractor. All data or counts that are not agreed upon by the Engineer shall be considered errors and count against the unit's calibration. In the event that the Engineer finds the verifying count data to have failed the performance requirements, the Contractor will have seven working days to re-calibrate and re-test the unit and re-submit new test data. Following three failed attempts, the Contractor shall replace the MVDS detector with a new unit.

TRAINING

The Contractor shall provide a minimum of 8 hours of training for up to 10 students selected by the Engineer. The content of the training shall include how to align, program, adjust, calibrate and how to maintain the unit. The Contractor shall provide materials and equipment for the training. The Contractor shall give the Engineer 15 working days notice prior to the training. The time and location shall be agreed upon by the Engineer and the Contractor. If no agreement can be reached, the Engineer shall determine the time and location.

MANUFACTURER'S REQUIREMENTS

The Contractor will select equipment from a manufacturer that will support the Contractor through training, demonstrations, site surveys and technical assistance to meet the MVDS system requirements as defined in these special provisions.

WARRANTY

The warranty shall be supplied in conformance with the provisions of Section 86-1.05, "Warrantees, Guarantees & Instruction Sheets" of the Standard Specifications. The manufacturer shall warrant the MVDS equipment to be free from defects and workmanship for a minimum period of 18 months after acceptance of the system. The manufacturer shall provide any replacement part(s) within 5 working days from the notification date of the component failure at no cost to the State.

10-3.11 WEATHER STATION

The Contractor shall furnish the weather station components and install and test the weather system which includes, the towers with weather sensing equipment, visibility sensor, network controller, all interfacing cables and connectors. The Contractor shall provide all necessary brackets, mounting flanges, cable terminations, terminal blocks, etc. for the completion of job as per manufacturers recommendation.

The weather station shall consist of the following components: data acquisition system, central processor, forward scatter visibility sensor, day/night detector, wind speed sensor, wind direction sensor, temperature/relative humidity sensor, rain gauge, barometric pressure sensor, 9.1 m self-supporting aluminum tilt-down tower, adapter tower, cross arm, lightning protection kit and all cables and mounting equipment.

The data acquisition system shall meet the following specifications:

1. Input Voltage: 80-135/160-270 V(ac), 50/60 Hz, 9-30 V(dc).
2. Serial Output: RS232, RS485, FSK.
3. Analog Output: 0-1, 0-5, 0-10 V(dc), 4-20 mA.
4. Sample Interval: 1 second.
5. Output/Storage Interval: Programmable from 1 second to 24 hours.
6. Transient Protection: MOV on power lines, Spark Gap and Transorbs on all signal and data lines.
7. Input Channels: 12 standard, expandable to 48.
8. Input Types:
   (1) Analog: Voltage, Current, Resistance, Pulse, Frequency.
   (2) Digital: RS232, RS485, FSK.
   (3) Resolution Analog: 16 bit.
9. Data Storage Memory:Internal: 64 Kb, Memory Card: 1 Mb.
10. Keypad/Display: Hex keypad, 2 line x 20 character LCD display.
11. Housing: NEMA 4X.
12. Operating Ambient Conditions:
    (1) Temperature: -40˚C to +65˚C.
    (2) Humidity: 0 to 100 percent condensing.
13. Solar Power Kit: 10 or 20 W.

The sensors shall meet the following specifications:

1. Wind Speed – Range: 0-72 m/s, Accuracy: +/-1 percent, Threshold: 0.22 m/s
2. Wind Direction – Range: 0 to 360 degrees, Accuracy: +/-2 degrees, Threshold: 0.22 m/s
3. Temperature – Range: -40˚C to + 60˚, Accuracy: +/-0.2˚, Sensing Element: Pt100 RTD
4. Humidity – Range: 0 to 100 percent, Accuracy: +/-2 percent (10 to 100 percent), +/-3 percent (0 to 10 percent), Sensing Element: Thin Film Capacitor
5. Barometric Pressure – Range: 600 to 1100 hPa, Accuracy: 0.88 hPa, Resolution: 0.1 hPa
6. Rain Fall – Sensitivity: 0.1 mm per tip, Accuracy: +/-0.5 percent at 12.7 mm per hour, Resolution: 0.1 mm Diameter of gauge: 200 mm
7. Solar Radiation – Spectral Response: 0.35 to 1.15 microns, Sensitivity: 70 $\mu V/W/m^2$, Accuracy: +/-5 percent.

The processing unit shall have two data transfer options to move data to TMC whenever there is change in the pre set values of sensor data or TMC may poll the processing unit at specified time interval to transfer and refresh the data.

The fold over tower shall be articulated at the 3.0 m level, with the third separating from the bottom section as the upper section is lowered. A 53 mm pipe bolted to the separating leg shall serve as a leverage arm, with the bottom end of the arm tied to a hand-operated winch. The tower shall withstand 140 km/h winds with a safety factor of 1.5.

All components of the Weather Station shall have a minimum 2-years manufacturer's warranty for parts and labor. Data communications between the weather station and the Traffic Management Center (TMC) shall be compatible with the existing District 10 Caltrans Automated Warning System.

Upon completion of work, each weather station shall be subjected to post-installation tests. All testing shall be performed by the District Traffic Management Center (TMC) Branch Personnel, arranged by the Engineer, and in the presence of the Contractor. The Contractor shall notify the Engineer in writing fifteen days prior to the scheduled testing. The Contractor shall provide all necessary equipment required for testing.

If any material and equipment furnished and installed by the Contractor is found defective or otherwise unsuitable, or the workmanship does not conform with the accepted standards, the Contractor shall replace such defective material and equipment at the Contractor's own expense.

10-3.13 PAYMENT

The contract lump sum price paid for changeable message sign system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in changeable message sign system, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for weather station shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in weather station, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for communication conduit shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in communication conduit, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for traffic monitoring station (MVDS) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in traffic monitoring station (MVDS), complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

ENGINEER'S ESTIMATE
10-3A4504

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	074017	PREPARE WATER POLLUTION CONTROL PROGRAM	LS	LUMP SUM	LUMP SUM	
2	074020	WATER POLLUTION CONTROL	LS	LUMP SUM	LUMP SUM	
3 (S)	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM	LUMP SUM	
4 (S)	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM	LUMP SUM	
5 (S)	128650	PORTABLE CHANGEABLE MESSAGE SIGN	LS	LUMP SUM	LUMP SUM	
6	150662	REMOVE METAL BEAM GUARD RAILING	M	190		
7	152320	RESET ROADSIDE SIGN	EA	1		
8	156579	REMOVE BRIDGE RAILING	M	31		
9	156590	REMOVE CRASH CUSHION (SAND FILLED)	EA	1		
10	160101	CLEARING AND GRUBBING	LS	LUMP SUM	LUMP SUM	
11	190110	LEAD COMPLIANCE PLAN	LS	LUMP SUM	LUMP SUM	
12 (S)	203003	STRAW (EROSION CONTROL)	TONN	1.9		
13 (S)	203014	FIBER (EROSION CONTROL)	KG	340		
14 (S)	203045	PURE LIVE SEED (EROSION CONTROL)	KG	18		
15 (S)	203056	COMMERCIAL FERTILIZER (EROSION CONTROL)	KG	340		
16 (S)	203024	COMPOST (EROSION CONTROL)	KG	1450		
17 (S)	203061	STABILIZING EMULSION (EROSION CONTROL)	KG	110		
18 (F)	560218	FURNISH SIGN STRUCTURE (TRUSS)	KG	20 886		
19 (S-F)	560219	INSTALL SIGN STRUCTURE (TRUSS)	KG	20 886		
20 (S)	031383	1524 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	M	21		